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Web servers under overload: How scheduling can help - Schroeder, Harchol-Balter (2002)   (10 citations) (Correct)

....if the loss rate is higher. **The** reason is that higher RTTs make loss recovery more expensive since timeouts depend on the (estimated) RTT. **E) Persistent Connections Next we explore how the response times change if multiple requests are permitted to use a single serial, persistent connection ([32]) for several requests.** Figure 6(E) left, middle) shows the results for the setup in Table 2, row (E) where every connection is reused 5 times. **Figure** 6(E) right) shows the response time as a function of the number of requests per connection, ranging from 0 to 10. **We** see that using persistent ....

....FreeBSD. **This** agrees with our study. **In** [35] the authors study the effect of WAN conditions, and find that losses and delays can affect response times. **They** use a different workload from ours (Surge workload) but have similar findings. **The benefits of persistent connections are evaluated by [32] and [10] in a LAN environment.** There are also several papers which study real web servers in action, rather than a controlled lab setting, e.g. 33] and [41] 7 Conclusion This paper provides a detailed performance study of the effect of overload on an Apache web server running over Linux and ....

J. C. Mogul. *The case for persistent-connection HTTP*. In Proceedings of ACM SIGCOMM '95, pages 299--313, October 1995.

Characterizing Alert and Browse Services for Mobile Clients - Adya, Bahl, Qiu (2002)   (2 citations) (Correct)

....0 100 200 300 0.E 00 1.E 06 2.E 06 3.E 06 4. **E 06 MessageID(sortedbymsgsize) Messagesize(#bytes) Figure 4: Size distribution of notification messages (including duplicates) One suggestion for reducing the overhead of connection setup and teardown is to use persistent connections [13], i.e. reuse a TCP connection for multiple transfers.** In our case, the servers sending the notification messages can maintain persistent connections with the gateways of the wireless ISPs and then send all messages on this connection. 4.2 Message Popularity Analysis and Its Implications ....

J. C. Mogul. *The Case for Persistent-Connection HTTP*. In Proceedings of ACM SIGCOMM 95, August 1995.

Managing TCP Connections under Persistent HTTP - Cohen, Kaplan, Oldham (1999)   (6 citations) (Correct)

....is established with a 3 way handshake; and typically several additional round trip times (RTT) are needed for TCP to achieve appropriate transmission speed [34] Each connection establishment induces user perceived latency and processing overhead. **Thus, persistent connections were proposed [31, 19, 32] and are now a default with the draft HTTP 1.**1 standard [17, 18] HTTP 1.1 keeps open and reuses TCP connections to transmit sequences of request response messages; hence, reducing the number of connection establishments and resulting latency and processing overheads. **Deployment** of HTTP 1.1 ....

....when using the same average amount of open connections. **Even** more significant reductions, typically around 50 , are achieved on the clicks logs. **The resulting performance improvement is considerable, since connection establishments induce user perceived latency and overhead [16, 31, 23] wheras large number of open connections is both detrimental to throughput [4] and is more likely to reach the server s hard set limits, causing it to refuse new connections.** In Section 2 we discuss the interaction between HTTP and TCP at Web servers, and the nature of server logs data. **We** then ....

J. C. Mogul. *The case for persistent-connection HTTP*. Computer Communication Review, 25(4):299--313, October 1995. http://www.research.digital.com/wrl/techreports/abstracts/95.4.html.

A Portable, Extensible and Efficient Implementation of.. - Arulanthu, Pyarali.. (Correct)

....server must minimize latency, maximize throughput, and avoid utilizing the CPU(s) unnecessarily. # Programming simplicity The design of the server should simplify the use of efficient concurrency strategies; # Adaptability Integrating new or improved transport protocols (such as HTTP 1. **1 [3]) should incur minimal maintenance costs.** A Web server can be implemented using several concurrency strategies, such as multiple synchronous threads and reactive synchronous event dispatching. **But** such conventional approaches have drawbacks as discussed in [1] The Proactor pattern provides a ....

J. C. Mogul, "*The Case for Persistent-connection HTTP*," in Proceedings of ACM SIGCOMM '95 Conference in Computer Communication Review, (Boston, MA), pp. 299--314, ACM Press, August 1995.

The Effect of Early Packet Loss on Web Page Download Times - Hall, Pratt, Leslie, Moore (2003) (Correct)

....Padmanabhan [2] Of particular relevance were persistent HTTP connections (P HTTP) and pipelining of multiple object requests over a single connection. **Experimental** data supported their recommendations and showed a significant reduction in overall latency for retrievals. **A following paper by Mogul [3] demonstrated the significant reduction in latency that would be achieved by using P HTTP and pipelining; extensive simulation also demonstrated the reduction in use of server resources under TCP TIMEWAIT states of various durations.** HTTP 1.1 [4] published in January 1997 incorporated persistent ....

J. C. Mogul, "*The case for persistent-connection http*," in Proceedings of the Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication. ACM Press, 1995, pp. 299--313.

Creating a Framework for Developing High-performance Web.. - Hu, Schmidt (Correct)

....and the server locates the file and returns it to the client requesting it. **On** the surface, therefore, Web servers appear to have few opportunities for optimization. **This may lead to the conclusion that optimization efforts should be directed elsewhere (such as transport protocol optimizations [11], specialized hardware [5] and client side caching [21, 12] Empirical analysis reveals that the problem is more complex and the solution space is much richer.** For instance, our experimental results show that a heavily accessed Apache Web server (the most popular server on the Web today [20] ....

....System Overview and Server Optimizations There are many levels at which research on Web server performance can be conducted. **Figure** 2 illustrate an architectural overview of a Web system and lists potential server side optimizations. **Low level solutions, such as transport protocol optimizations [11] and specialized hardware [5] are beyond the scope of our work.** While these solutions can improve the end to end performance of a Web system, they do not directly solve the problem of Web server efficiency. **Therefore**, our research will leverage off existing work in this field [2, 4, 5] and will ....

Jeffrey C. Mogul. *The Case for Persistent-connection HTTP*. In Proceedings of ACM SIGCOMM '95 Conference in Computer Communication Review, pages 299--314, Boston, MA, USA, August 1995. ACM Press.

Validating Arbitrarily Large Network Protocol.. - Bradley, Bestavros.. (2002) (Correct)

....a 2 A which does not match either of these patterns can be reduced to one which does. **These** three properties are proven in Appendix A as Lemmas A.1, A.2, and A.3, respectively. 16 3. **2 HTTP Connection Management One early HTTP protocol optimization was the introduction of persistent connections [24].** This feature allows multiple transactions to be sequentially conducted over a single transport (TCP) connection, amortizing the cost of TCP connection setup and teardown. **This** feature is the cornerstone of the connection management features introduced in HTTP 1.1 [21] which standardizes the ....

Jeffrey C. Mogul. *The case for persistent-connection HTTP*. In Proceedings of ACM SIGCOMM '95, August 1995.

Validating Arbitrarily Large Network Protocol.. - Bradley, Bestavros.. (2002) (Correct)

....a ##which does not match either of these patterns can be reduced to one which does. **These** three properties are proven in Appendix A as Lemmas A.1, A.2, and A.3, respectively. 16 3. **2 HTTP Connection Management**

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Jeffrey C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of ACM SIGCOMM '95, August 1995.

The Transmission Control Protocol - Noureddine, Tobagi (2002)   (Correct)

.... that most request sizes are smaller than 500 bytes, and therefore t in a typical size TCP segment (about 500 bytes) On the other hand, the mean size of a reply (carrying one component of a page) is typically between 10,000 and 20,000 bytes, and the median ranges between 1,000 and 2,000 bytes [131]. This relatively early study found that most Web pages contain fewer than 5 in lined les, have an average size smaller than 32KB, and 90 of them are smaller than about 200KB [119] In a summary of Web studies [159] an average HTML le size of about 5KB, with a median of 2KB, and an average ....

....is the main requirement for Web applications. **Human** factors studies report that the performance rating is considered to be very good for download times below 5 seconds. **Download times between 5 and 10 seconds may be acceptable, whereas times larger than 10 seconds give low performance ratings [31, 34, 131].** In addition, since users highly value predictable performance, the variance of the page downloads also needs to be small. It is possible to signi cantly improve user perceived performance of Web browsing by insuring that some form of early feedback for a transaction is received within a few ....

[Article contains additional citation context not shown here]

Mogul J., *The Case for Persistent-Connection HTTP*, in Proceedings of SIGCOMM'95, August 1995.

Socket Cloning for Cluster-Based Web Servers - Sit, Wang, Lau (2002)   (Correct)

....without the need to synchronize the web server nodes or to prevent the TCP stream from draining during cloning. **Figure** 6 summarizes the workflow of a cluster based web server with Socket Cloning for a nonpipelined persistent HTTP connection. **Some modern web browsers support pipelining of requests [23] in which a browser can send out requests before receiving a complete response is also supported.** SC is also designed to handle this service. **The** length of the requested file is noted by the original node when it clones the socket. **The** Packet Router compares the acknowledged sequence number from ....

J. C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of the SIGCOMM'95 conference, Cambridge, MA, Aug. 1995.

A Scalable Cluster-based Web Server with Cooperative Caching.. - Chen, Wang, Lau (2002)   (3 citations) (Correct)

....be pipelined via a single TCP connection. **The** persistent connection eliminates unnecessary TCP connection Object ID URL NO. **Inter** Local Data Access Network Communication Running lhread Figure 2. **Workflow of GOS 16 setup time, resulting in improved user perceived latency and performance [51].** In our proposed system, because all the objects in the system are accessible via the Gas service, a request handling node can keep persistent connection with the client, while fetching object from other nodes via Gas. **Without** a Gas where objects can be shared on a global basis, it is very ....

Mogul J. *The Case for Persistent-Connection HTTP.* Proceedings of the ACM SIGCOMM '95 Symposium, Cambridge, USA, August 28-September 1, 1995.

Architectures for Service Differentiation in Overloaded Internet.. - Voigt (2002)   (Correct)

....in combination with acquired knowledge about resource consumption of requests. **An** overload protection architecture also needs to deal with persistent connections. **Persistent connections allow clients to send several requests on the same TCP connection to reduce client latency and server overhead [41].** Persistent connections represent a challenging problem for web server admission control, since the HTTP header of the first request does not reveal any information about the resource consumption of the requests that may

follow on the same connection. **This** problem is addressed in Paper C. 1.2.2 ....

....literature. **Web** servers use admission control for overload protection. **Some** web servers base their admission decision on information found in the HTTP header. **Persistent connections allow HTTP clients to send several requests on the same TCP connection to reduce client latency and server overhead [41].** Using the same TCP connection for several requests makes admission control more di# cult, since the admission control decision should be performed when the first request is received. **However,** the HTTP header of the first request does not reveal any information about the resource consumption of ....

J. C. Mogul. *The case for persistent-connection HTTP.* In SIGCOMM '95 Conference Proceedings, pages 299–313, Cambridge, MA, USA, August 1995. ACM SIGCOMM Computer Communication Review, 25(4).

Enhancing Network Object Caches through Cross-Domain Cooperation - Hughes   (Correct)

....it was last used. **Caches** are also used in file systems, compilers, operating systems, and hardware. **Extended** Use predictions are useful for managing resources or connections. **Applications** that lease resources may predict the extension of their use. **In the web, persistent HTTP connections [Mog95, FGM99] are the most cormnon example.** Maintaining the connection to a web server avoids incurring additional setup delays for future requests to the server. **Extending** HTTP connections adds an additional management burden on both the client and the server machine that might be managed through ....

Mogul, J. C., "*The Case for Persistent-Connection HTTP*", in Proceedings of ACM SIGCOMM '95 Conference, Cambridge, Massachusetts, August 1995, pp. 299-314.

An Architecture for Highly Concurrent, Well-Conditioned Internet.. - Welsh   (Correct)

....load lasted 500 seconds. **To** more closely simulate the connection behavior of clients in the wide area, each client closes its TCP connection to the server after 5 HTTP requests, and reestablishes the connection before continuing. **This value was chosen based on observations of HTTP traffic from [98].** Note that most Web servers are configured to use a much higher limit on the number of HTTP requests per connection, which is unrealistic but provides improved benchmark results. **All** measurements below were taken with the server running on a 4 way SMP 500 MHz 126 0 20 40 60 80 100 120 ....

J. C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of ACM SIGCOMM '95, October 1995.

Cyclone: A High-Performance Cluster-Based Web Server with.. - Yiu-Fai Sit Cho-Li   (Correct)

No context found.

J. C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of the SIGCOMM'95 conference, Cambridge, MA, Aug. 1995.

Persistent Dropping: An Efficient Control of Traffic - Aggregates Hani Jamjoom   (Correct)

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J. C. Mogul, "*The Case for Persistent-Connection HTTP,*" in Proceedings of the ACM SIGCOMM '95, 1995, pp. 299--313.

Using Bundles for Web Content Delivery - Craig Wills Gregory (2003)   (Correct)

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The WebTP Architecture and Algorithms - Ye Xia Hoi-Sheung   (Correct)

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J. Mogul. *The Case for Persistent-Connection HTTP.* ACM Proceeding Sigcomm '95, pages 299--313, August 1995. http://www.research.digital.com/wrl/techreports/abstracts/95.4.html.

Submitted for publication to ACM Computer Communication.. - Http And Tcp   (Correct)

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Jeffrey C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of the SIGCOMM '95, pages 299--313. ACM, August 1995.

Web servers under overload: How scheduling can help - Schroeder Harchol-Balter.. (2002)   (10 citations) (Correct)

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J. C. Mogul. *The case for persistent-connection HTTP.* In Proceedings of ACM SIGCOMM '95, pages 299--313, October 1995.

Web servers under overload: How scheduling can help - Bianca Schroeder Mor (2003)   (10 citations) (Correct)

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No context found.

Mogul, J. *The case for persistent-connection HTTP.* In Computer Communication Review, pages 299-313, October 1995.

The Performance Of Clustering Techniques For Scalable Web Servers - Zhang (2002)   (Correct)

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Jeffrey C. Mogul (1995). "*The Case for Persistent-Connection HTTP.*" Proceedings of the SIGCOMM '95 Conference on Communications Architectures 213 and Protocols: 299-313. http://www.research.compaq.com/wrl/techreports/abstracts/95.4.html .

Network Monitoring with Nprobe - Andrew Moore Rolf (2002)   (Correct)

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A **proxy** server MUST NOT establish a **HTTP**/1.1 **persistent** connection ... [26]
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... Banga of Network Appliance, **Jeffrey** C. **Mogul** of Compaq Computer Corporation,
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The server responds to the **proxy**: **HTTP**/1.1 200 OK Date: Fri, 06 Dec 1996 18:44:29
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were ... [2] Gaurav Banga, **Jeffrey** C. **Mogul**, and Peter Druschel. ...

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Author, R. Fielding, J. Gettys, J. **Mogul**, H. Frystyk, T. Berners-Lee ... [26]
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RFC 2068
10.4.8 407 **Proxy** Authentication Required 10.4.9 408 Request **Timeout ...** o **HTTP/1.1**
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